Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Presented) A method for detection and recognition of an object that includes a plurality of sub-objects, the sub-object having a plurality of unique physical parameters; said object located in a selected region, and said sub-objects having a background, the method comprising the steps of:

(a) acquiring electromagnetic radiation data of electromagnetic radiation emitted from the selected region in at least two spectral bands by measuring it in at least one time, each time in said spectral bands, thus obtaining at least two readings;

(b) recording the acquired electromagnetic radiation data by means of a suitable radiation data recording means;

(c) storing the recorded electromagnetic radiation data in a suitable electromagnetic radiation data storage means;

(d) deriving descriptive maps constituted by pixels of the selected region from the electromagnetic radiation data stored in said suitable electromagnetic radiation data storage means; and

(e) classifying the pixels of said descriptive maps of said selected region by pattern recognition processor means, the classifying by sorting the pixels into classes comprising the steps of describing statistical distribution of the pixels by using a poly-Gauss expansion; and calculating probabilities of association of the pixels with the classes by using Bayes' formula,

whereby the desired object detection and recognition are achieved.

2. (Previously Presented) A method for detection and recognition of an object that includes a plurality of sub-objects, the sub-object having a plurality of unique physical

parameters; said object located in a selected region, and said sub-objects having a background, the method comprising the steps of:

(a) acquiring electromagnetic radiation data of electromagnetic radiation emitted from the selected region in at least two spectral bands by measuring it in at least one time, each time in said spectral bands, thus obtaining at least two readings;

(b) recording the acquired electromagnetic radiation data by means of a suitable radiation data recording means;

(c) storing the recorded electromagnetic radiation data in a suitable data storage means;

(d) acquiring meteorological data indicative of climatic conditions of the selected region on the ground and the surrounding atmosphere;

(e) recording the meteorological data by means of a suitable meteorological data recording means;

(f) storing the meteorological data in suitable meteorological data storage means,

(g) deriving descriptive maps constituted by pixels of the selected region from the electromagnetic radiation data stored in said suitable electromagnetic data storage means and the meteorological data stored in said suitable meteorological data storage means; and

(h) classifying the pixels of said descriptive maps of said selected region by pattern recognition processor means, the classifying by sorting the pixels into classes comprising the steps of describing statistical distribution of the pixels by using a poly-Gauss expansion; and calculating probabilities of association of the pixels with the classes by using Bayes' formula,

whereby the desired object detection and recognition are achieved.

3. (Previously Presented) The method according to claim 1 wherein said electromagnetic radiation data are provided in infrared spectrum area.

4. (Previously Presented) The method according to claim 1, wherein the step of deriving descriptive maps of the selected region is performed by solving a system of a number of equations for deriving temperature and/or emissivity descriptive maps, the number of equations equals to the number of said readings, each equation describing the electromagnetic radiation that is emitted from the region in one of said bands as a function of the temperature and the emissivity of the region, wherein the emissivity is a function of at least two arguments being temperature and wavelength.

5. (Original) The method according to claim 2 wherein said meteorological data are humidity, atmospheric temperature and wind velocity, the data obtained from meteorological stations.

6. (Original) The method according to claim 4 wherein said descriptive maps are temperature, emissivity and albedo descriptive maps determined with respect to a plurality of representative segments of the region, and mapping of the determined values to a representative pixel of the descriptive maps, wherefrom at least one set of characteristic maps of the selected region is derived by incorporating suitable reference data.

7. (Original) The method according to claim 6 further comprising the step of deriving an optimal set of characteristic maps of the selected region.

8. (Original) The method according to claim 7 wherein a step of classifying pixels of said descriptive maps further comprising the steps of defining a quality function and determining a set of characteristic maps that makes the quality function maximal.

9. (Previously Presented) The method according to claim 1, further comprising the step of determining the shape of the detected object by geometrical classification means included additionally in the pattern recognition processor means.

10. (Previously Presented) The method according to claim 1, adapted for real time mapping of different physical characteristics of a plurality of selected regions to be observed.

11. (Previously Presented) The method according to claim 1, adapted for real time mapping and classifying different physical characteristics of a plurality of selected regions to be observed, wherein the step of acquiring said electromagnetic radiation data is provided in real time by equipment mounted on a moving platform while displacing along said plurality of representative segments of the regions; and wherein the steps of recording, storing the acquired electromagnetic radiation data, and deriving descriptive maps of the selected region from the acquired electromagnetic radiation data are all registered with displacement of the platform.

12. (Previously Presented) The method according to claim 10, wherein said different physical characteristics are selected from the group consisting of temperature, emissivity and albedo.

13. (Original) The method according to claim 11 further comprising the step of automatic detecting and recognizing objects from the moving platform.

14. (Previously Presented) The method according to claims 1, applied for detection of underground structures detection, comprising the steps of:

(a) extracting physical information from the recorded data, said physical information characterizing heating and cooling processes that take place at the ground surface and below it by applying an equation of energy balance and a set of thermophysical constants;

(b) processing the information for detecting thermophysical inhomogeneous regions, the regions having different thermal properties in the region selected for scanning; and

(c) classifying the inhomogeneous regions by said pattern recognition processor means, thereby identifying the underground structures.

15. (Original) The method according to claim 14 wherein derivation of the descriptive and characteristic maps is based on Planck's equation describing the electromagnetic radiation that is emitted from and reflected by the ground.

16. (Original) The method according to claim 15 wherein characteristic maps are selected from the group essentially consisting of maps of thermal inertia, thermal flux, coefficient of heat transfer and coefficient of mass transfer.

17. (Canceled)

18. (Previously Presented) A system for detection and recognition of an object that include a plurality of sub-objects, said object located in a selected region, and said sub-objects having a background, the system comprising:

(a) means for acquiring and recording electromagnetic radiation data of electromagnetic radiation emitted from the selected region having at least one sensor;

(b) means for acquiring and recording meteorological data indicative of climatic conditions of the selected region on the ground and the surrounding atmosphere;

(c) storage means coupled with the acquiring and recording means for storing the electromagnetic radiation and meteorological data,

(d) a processor coupled with said storage means for deriving descriptive maps of the selected region from the stored meteorological and electromagnetic radiation data, descriptive maps constituted by pixels of the selected region from the [so-]stored electromagnetic radiation data; and

(e) a pattern recognition processor means being in communication with said processor for classifying pixels of said descriptive maps of said selected region by sorting the pixels into classes, the classifying by using a poly-Gauss expansion in order to describe the

statistical distribution of the pixels and the Bayes' formula in order to calculate the probabilities of association of the pixels with the classes.

19. (Original) The system according to claim 18 wherein means for acquiring meteorological data provides humidity, atmospheric temperature and wind velocity, the data obtained from meteorological stations.

20. (Currently Amended) The system according to ~~claim 17~~ claim 18 wherein said sensor for acquiring electromagnetic radiation data of electromagnetic radiation emitted from the selected region operate in infrared spectrum area.

21. (Currently Amended) The system according to ~~claim 17~~ claim 18 wherein said processor is capable of deriving from said descriptive maps a set of characteristic maps.

22. (Currently Amended) The system according to ~~claim 17~~ claim 18 wherein said pattern recognition processor means is integrated with an optimizing means for selecting an optimal set of characteristic maps, which is subjected to classification of pixels.

23. (Currently Amended) The system according to ~~claim 17~~ claim 18 wherein said pattern recognition processor means is integrated with an classification means in which a number of classes is defined, whereby the classified pixels are statistically associated with the classes.

24. (Original) The system according to claim 22 wherein said pattern recognition processor means are further integrated with a quality factor evaluation means.

25. (Currently Amended) The system according to ~~claim 17~~ claim 18 wherein said pattern recognition processor means further include additional geometrical classification means for determining the shape of the detected object.

26. (Currently Amended) The system according to ~~claim 17~~ claim 18 wherein the means for acquiring and recording electromagnetic radiation data are positioned on a movable

platform, whereas the means for storage the data, said processor, and the pattern recognition processor means are placed on the ground.

27. (Original) The system according to claim 18 wherein the means for acquiring meteorological data and the means for acquiring and recording electromagnetic radiation data are positioned on a movable platform, whereas the means for storage the data, said processor, and the pattern recognition processor means are placed on the ground.

28. (Currently Amended) The system according to ~~claim 17~~ claim 18 wherein the means for acquiring and recording electromagnetic radiation data, the means for storage the data, said processor, and the pattern recognition processor means are portable and mountable on movable platform.

29. (Original) The system according to claim 18 wherein the means for acquiring meteorological data, the means for acquiring and recording electromagnetic radiation data, the means for storage the data, said processor, and the pattern recognition processor means are portable and mountable on movable platform.

30. (Currently Amended) The system according to ~~claim 17~~ claim 18 wherein said pattern recognition processor means are capable of automatic detection and recognition of the objects.

31. (Currently Amended) ~~The system according to claim 17~~ A system for detection and recognition of an object that include a plurality of sub-objects, said object located in a selected region, and said sub-objects having a background, the system comprising:

(a) a means for acquiring and recording electromagnetic radiation data of electromagnetic radiation emitted from the selected region having at least one sensor;

(b) a storage means coupled with the acquiring and recording means for storing the electromagnetic radiation data;

(c) a processor coupled with said storage means for deriving descriptive maps of the selected region from the stored electromagnetic radiation data, descriptive maps constituted by pixels of the selected region from the stored electromagnetic radiation data; and

(d) a pattern recognition processor means being in communication with said processor for classifying pixels of said descriptive maps of said selected region by sorting the pixels into classes, the classifying by using a poly-Gauss expansion in order to describe the statistical distribution of the pixels and the Bayes' formula in order to calculate the probabilities of association of the pixels with the classes,

wherein said pattern recognition processor means are capable of extracting physical information from the recorded data, said physical information characterizing heating and cooling processes that take place on a ground surface and below it by applying an equation of energy balance and a set of thermophysical constants, processing the information for detecting thermophysical inhomogeneous regions, the regions having different thermal properties in the region selected for scanning, and classifying the inhomogeneous regions by said pattern recognition processor means, thereby providing identification and display of the underground structures.

32. (Currently Amended) ~~The system according to claim 17~~ A system for detection and recognition of an object that include a plurality of sub-objects, said object located in a selected region, and said sub-objects having a background, the system comprising:

(a) a means for acquiring and recording electromagnetic radiation data of electromagnetic radiation emitted from the selected region having at least one sensor;

(b) a storage means coupled with the acquiring and recording means for storing the electromagnetic radiation data;

(c) a processor coupled with said storage means for deriving descriptive maps of the selected region from the stored electromagnetic radiation data, descriptive maps constituted by pixels of the selected region from the stored electromagnetic radiation data; and

(d) a pattern recognition processor means being in communication with said processor for classifying pixels of said descriptive maps of said selected region by sorting the pixels into classes, the classifying by using a poly-Gauss expansion in order to describe the statistical distribution of the pixels and the Bayes' formula in order to calculate the probabilities of association of the pixels with the classes,

wherein the means for acquiring electromagnetic radiation data are further integrated with a spatial optical filter divided into a number of sites for simultaneous acquiring of the electromagnetic radiation from a plurality of segments of the object, each the site having N zones responsible for splitting the radiation acquired by the site into N spectral bands, wherein N is at least two, thereby acquiring the electromagnetic radiation in all N spectral bands simultaneously.

33. (Currently Amended) The system according to ~~claim 17~~ claim 18 wherein the means for acquiring electromagnetic radiation data are further integrated with a rotatable optical filter for acquiring the electromagnetic radiation in at least two spectral bands in sequence.